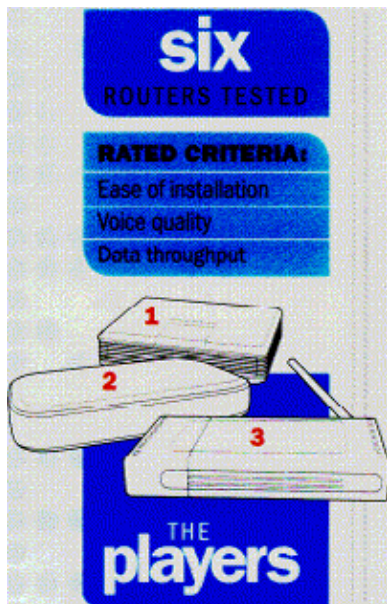




Size: 112.98 sq. cm.

# QoS VoIP routers

Stephen Withers checks out six routers that should improve your VoIP performance.



First-generation VoIP adaptors brought simple and affordable Internet-based calling to the consumer and small office markets. All you needed to do was hook up the adaptor to the network switch or router, a phone to the adaptor, and connect the power pack. You could be enjoying your first cheap call within seconds.

But there was a snag. Depending on the codec, VoIP can use a fair percentage of the upstream bandwidth of low-end broadband connections. That means it's liable to be interrupted by simultaneous traffic. If a packet of data going from your email client

to a server takes a little longer than usual, nobody will detect the difference. Voice traffic, however, is extremely time-sensitive, and if a packet of voice data is delayed the listener will immediately notice.

The answer is to apply Quality of Service (QoS) rules so the voice traffic takes priority. All but one of the devices tested here have built-in VoIP adaptors, making the job relatively easy: if a packet from the adaptor is waiting, it forwards it, and only looks at the other ports if there are no voice packets waiting.

This works well as long as two conditions are met. Firstly, the link to the ISP must be sufficient for the

voice traffic, with enough left over to give data traffic the throughput you need. It's not that two simultaneous conversations will flood a 128Kbit/s link (apart from D-Link's DI-102, the products tested here all have two phone ports), as there will still be room for data packets to be transmitted between the voice packets, but prioritising voice means everything else will be delayed. This is especially noticeable when uploading a large file to an FTP server, for example.

A QoS router helps deliver better audio quality when other bandwidth-intensive applications are running simultaneously, but at

Vendor	Model	Price	Online	Phone
1. Linksys	Sioura SPA-2100	\$149	<a href="http://www.linksys.com.au">www.linksys.com.au</a>	1800 678 808
2. Netgear	TA612V	\$179	<a href="http://www.netgear.com.au">www.netgear.com.au</a>	1800 502 061
3. D-Link	DVG-G1402S	\$299.95	<a href="http://www.dlink.com.au">www.dlink.com.au</a>	1300 700 100



Date: Wednesday, 1 February 2006  
Page Number: 58  
Edition: February  
Supplement: Main

Market: National  
Circulation: 51,626  
Published: MONTHLY  
Editorial: [email the editor](#)  
Item No: P8897531

Size: 233.40 sq. cm.





Date: Wednesday, 1 February 2006  
Page Number: 59  
Edition: February  
Supplement: Main

Market: National  
Circulation: 51,626  
Published: MONTHLY  
Editorial: [email the editor](#)  
Item No: P8897531

Size: 93.24 sq. cm.



the expense of those other applications' performance.

The device applying QoS should be the last thing on your network before the modem. If not, QoS will not be applied to the packets introduced by the devices connected upstream. So, if your modem has a built-in router and switch, don't connect anything other than the QoS router to it.

Although QoS in your router will prioritise VoIP on the link to the ISP, you shouldn't expect voice packets to get priority in your provider's network or on the Internet as a whole. In practice this doesn't seem to be a major problem, as we found

QoS-enabled VoIP calls came close to the quality of PSTN calls.

Curiously, we found QoS improved the audio quality even when the network activity was otherwise very light (eg. only two active computers; neither doing anything other than background operations such as checking for email or time synchronisation).

The devices here were tested on an OptusNet cable connection with 256Kbit/s upstream bandwidth.

#### EASE OF INSTALLATION

If you already have a router, the hardware installation is easy: unplug the Ethernet cables from

the old one, plug them into the new one and then connect the power supply. The manufacturers' instructions usually recommend switching everything off before you begin, powering up the modem first, waiting for it to initialise, then the router (another wait) and finally the computers. We concur, as this ensures the modem collects the DHCP settings from the ISP, the router gets them from the modem, and then the computers get their settings from the router.

Given that these devices are often installed under desks or in cupboards, clear labelling of the various ports can be very helpful.

In good light, it doesn't make much difference, but we had problems with some. The Linksys WRT54GP2 has labels moulded into the case, which makes them very difficult to read, but layout means that isn't a big deal. The Netgear TA612V has a printed label on the base — the print is on the small side and the ports are strangely numbered from



Vendor	Model	Price	Online	Phone
4. NetComm	V300	\$199.10	<a href="http://www.netcomm.com.au">www.netcomm.com.au</a>	(02) 9424 2000
5. Linksys	WRT54GP2	\$239	<a href="http://www.linksys.com.au">www.linksys.com.au</a>	1800 678 808
6. D-Link	DI-102	\$169.95	<a href="http://www.dlink.com.au">www.dlink.com.au</a>	1300 700 100





Date: Wednesday, 1 February 2006  
Page Number: 59  
Edition: February  
Supplement: Main

Market: National  
Circulation: 51,626  
Published: MONTHLY  
Editorial: [email the editor](#)  
Item No: P8897531

Size: 292.77 sq. cm.





Date: Wednesday, 1 February 2006  
Page Number: 60  
Edition: February  
Supplement: Main

Market: National  
Circulation: 51,626  
Published: MONTHLY  
Editorial: [email the editor](mailto:email_the_editor)  
Item No: P8897531

Size: 244.85 sq. cm.



right to left. In addition, the phone sockets are upside down compared to the Ethernet sockets. The Linksys Sipura SPA-2100 has small, low-contrast labels beneath the colour-coded ports. Its activity lights are also on the back panel. The very compact D-Link DI-102 also uses colour coding, and the contrast is reasonable (though the text is smaller than we'd like). Its stablemate, the DVG-G1402S has larger and clearer labelling, and all the connectors are aligned the same way. It's just a shame the ports are numbered from right to left. The NetComm V300 gets our vote for the clearest labels, consistently aligned connectors and left-to-right port numbering.

Plugpack size can also be an issue in cluttered environments. The Linksys WRT54GP2, Netgear TA612V and D-Link DVG-G1402S use traditional designs that take up more than one space on a powerboard, while the D-Link DI-102, Linksys Sipura SPA-2100 and NetComm V300 have more modern, slimline plugpacks.

Once the hardware is set up, configuration is carried out via a Web browser. How closely the defaults match your needs depends mainly on whether you're on cable or ADSL, and whether you are using the VoIP account bundled with the hardware. VoIP setup is reasonably straightforward if you work methodically, but variations in terminology used by different companies can be confusing — buying a device with a bundled VoIP account gets around this.

Whatever else you do, set a new password on the router to prevent unauthorised tampering.

The Netgear TA612V comes with QoS disabled. According to a Netgear spokesperson, this is because different customers have varying needs. It can be auto-provisioned by the major VoIP providers, although none of them do so at present.

The D-Link DVG-G1402S's wizard steps you quickly through the

network setup process, and QoS is enabled by default.

The Linksys WRT54GP2 has a Windows-only wizard on the CD-ROM, instead of it being built-in to the Web browser, but its use is optional. The double-tabbed Web interface initially seems busy, but we quickly became used to it and found it easy to navigate. Some advanced settings are accessible only through a "hidden" page. Voice QoS is on by default, and QoS can be set (high or low) for FTP, HTTP, Telnet, SMTP, POP3, and for up to three specific TCP ports to cater for other applications. Traffic on the three Ethernet ports can be categorised as low or high, with optional rate limiting to ensure one computer (or group of computers, if you attach a switch to a router port) doesn't grab more than its fair share of the bandwidth.

We ran into a problem trying to configure the Linksys Sipura SPA-2100, as attempts to change the settings generated "403 Forbidden!" messages. Changing the browser from Internet Explorer to Firefox solved that one. The Sipura interface presents the settings in larger chunks than most, which can be overwhelming. QoS was disabled by default; a particular problem as there's nothing in the documentation about enabling QoS, and the alternatives are CBF or TBF. According to a Linksys engineer, TBF (Token Bucket Filter) is the go.

NetComm's V300 has a well-organised Web interface. There's no wizard, but if you work through the first four sections you won't go far wrong. QoS is not enabled, but the fourth item on the navigation bar is VOIP QoS, so it's not hard to find.

The D-Link DI-102 is the odd man out in this collection of products, as it is neither a router nor a VoIP adaptor. Instead, it installs between a router and a modem to prioritise voice packets. We tested it with a DI-824VUP+

router and an engin Voice Box (Sipura SPA-2000). By default,

the DI-102 is self-configuring, automatically determining the speed and type of Internet service. A simple Web interface provides access to the limited number of settings.

#### VOICE QUALITY

Voice quality was consistent across all the routers with built-in VoIP adaptors. With QoS enabled, it's better than mobile-to-landline, but not quite as good as landline-to-landline. Without QoS, the perception was of slightly lower quality (on a quiet network), but dropouts were a real problem when we loaded it with traffic.

The D-Link DI-102's automatic configuration overestimated the upstream bandwidth of our cable connection and therefore did not provide sufficient throughput for the VoIP traffic. This resulted in dropouts during file uploads. When we manually set the upstream bandwidth to reflect the actual bandwidth, the dropouts disappeared.

#### DATA THROUGHPUT

We tested data throughput by uploading a 900KB file to the ISP's FTP server. With QoS disabled and no voice traffic, the times were all very similar.

Turning on QoS made a big difference to some devices' performances. The Linksys Sipura SPA-2100 took about twice as long once QoS was activated, but adding voice traffic only slowed it slightly after that.

QoS initially made no difference to the Linksys WRT54GP2's throughput (without voice traffic), provided the MTU setting was left at the default 1500. However, the transfer took almost twice as long while a call was in progress. Linksys's recommended MTU of 580 slowed the transfer significantly.

The D-Link DVG-G1402S was problematic. Without voice traffic, the file transfer was as fast as the





Date: Wednesday, 1 February 2006  
Page Number: 60  
Edition: February  
Supplement: Main

Market: National  
Circulation: 51,626  
Published: MONTHLY  
Editorial: [email the editor](#)  
Item No: P8897531

Size: 78.92 sq. cm.



“ QUALITY OF SERVICE (QoS) RULES  
ENSURE THAT VOICE TAKES  
PRIORITY OVER OTHER TRAFFIC





Date: Wednesday, 1 February 2006  
Page Number: 62  
Edition: February  
Supplement: Main

Market: National  
Circulation: 51,626  
Published: MONTHLY  
Editorial: [email the editor](mailto:email_the_editor)  
Item No: P8897531

Size: 246.53 sq. cm.



other routers. Yet, when an FTP transfer started while a call was in progress, it was the slowest by a big margin and the slow speed continued after the call was terminated. This seemed anomalous, so we checked with D-Link. The company confirmed our results and put the finger on the pre-release firmware in the review sample, assuring us it would be fixed before units ship to customers.

We previously mentioned that we had to manually set the upstream bandwidth on the D-Link DI-102, but this resulted in the file transfer taking eighteen times longer than with the default setting. The default gave throughput equivalent to the router alone, but at the cost of voice quality.

The NetComm V300 was a strong performer. The QoS penalty was just 20% with no voice traffic, and around 35% while a call was in progress.

The Netgear TA612V was the pick of the bunch when we used an MTU of 1500 as recommended by a Netgear engineer (rather than 580 as specified in the help text). Activating QoS had no noticeable effect on throughput; a voice call imposed a penalty of less than 10%.

Our conclusion is that while QoS results in clearly improved voice quality, it often comes at a cost. It's obvious that prioritising VoIP traffic means that other packet types may be delayed, but there are wide variations in how well the different devices handle the task.

With two exceptions, all the devices tested have two phone ports. As previously mentioned, the D-Link DI-102 is intended for use with external VoIP adaptors. While the NetComm V300 has one phone port, it is unique among these products for the provision of a phone line connection. This means VoIP and landline calls can be made or received using a single handset, and it also allows outgoing calls when the Internet connection or VoIP provider are down. 000 calls are automatically routed through the landline.

The D-Link DVG-G1402S and the Linksys WRT54GP2 are both 802.11g/Ethernet routers; the others are Ethernet only. The NetComm V300 and Linksys

### OTHER FEATURES

	D-LINK DI-102	D-LINK DVG-G1402S	LINKSYS SIPURA SPA-2100	LINKSYS WRT54GP2	NETCOMM V300	NETGEAR TA612V
VOIP PORTS	0	2	2	2	1	2
PSTN FAILOVER	No	No	No	No	Yes	No
ETHERNET PORTS	1	4	1	3	3	3
802.11G	No	Yes	No	Yes	No	No
	Simple installation.	Four Ethernet ports.	Compact.	Full-featured.	PSTN failover.	Best performance.
	Poor data throughput.	Performance questions from pre-release firmware.	Daunting setup.	Mid-range performance.	Single VoIP port.	Single Ethernet port.
Verdict	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆	★★★★☆





Date: Wednesday, 1 February 2006  
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Size: 126.24 sq. cm.



WRT54GP2 have three Ethernet ports, the D-Link DVG-G1402S has four, and the Netgear TA612V and Linksys Sipura SPA-2100 are single-port devices that would normally be used with a switch.

As this is primarily a test of VoIP and QoS features, we won't catalogue all the router features such as firewalls and filtering. If that sort of thing is important to you, check the manufacturers' specification sheets.

### THE VERDICT

We'd prefer to reserve judgment on the D-Link DVG-G1402S until the firmware is finalised. The company was brave enough to provide

a pre-release sample, but the performance just wasn't there. Wireless capability and four Ethernet ports make it the connectivity leader.

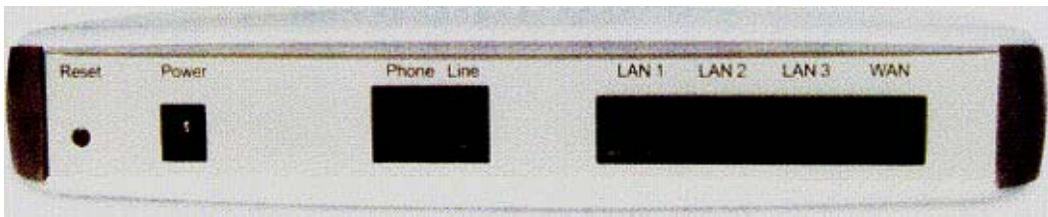
It's hard to see a niche for the D-Link DI-102. If it was about half the price, it could be worthwhile for those who already own a VoIP adaptor and an Ethernet router (but want to add QoS for improved voice quality). As it is, you might as well buy the Linksys Sipura SPA-2100 and get a two-line VoIP adaptor and better throughput for less money. Indeed, the SPA-2100 is almost as cheap as some single-port VoIP ATAs (analogue telephone adaptors) while delivering good

voice quality and reasonable data performance.

The Linksys WRT54GP2 has a useful feature set if you want Wi-Fi (including support for WPA Radius in addition to PSK), good filtering and flexible non-VoIP QoS.

Netgear's TA612V is a good performer and well priced, and therefore takes our Best Value award. The single Ethernet port is its main shortcoming — an external switch just adds to the clutter.

Our Editor's Choice goes to the NetComm V300. It's reasonably priced, delivers good voice quality and data throughput, and is easy to set up. **ETC**



**Baby got back:** if you already have a router, hardware installation is easy (just remember to power up your modem first).